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A REVIEW OF FOREIGN FARM POLICY, PRODUCTION, AND TRADE

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Agriculture and Foodstuffs in Taiwan (Formosa)

by **RAYMOND T. MOYER***

The use which Japan has made of Taiwan (Formosa) as a military outpost, to guard its southern approaches and advance into the south Pacific, is common knowledge. The importance of this island as a source of foodstuffs is less well understood. Although the total area is small, its cultivated portions have been highly developed. Agricultural production has been in sufficient quantity to provide most of the foodstuffs needed by its dense population and quite substantial quantities of certain products for export.

The Country and People

The island of Taiwan lies approximately 90 miles from the nearest point on the mainland of China, off the coast of Fukien. It is about 250 miles long, and its maximum width is somewhere between 90 and 100 miles. Together with the nearby Pescadores Islands and other small islands, which are included under its administration, it has a total area of about 13,885 square miles or less than one-fourth the area of Florida.

The word Formosa is of Portuguese origin, meaning beautiful. The Chinese and Japanese both call the island Taiwan, which comes from two Chinese characters that mean an elevated area and a bay. These words are descriptive of certain characteristics of its physical setting. A chain of rugged mountains occupies eastern and central Formosa, in which 48 peaks rise to an elevation of more than 10,000 feet. These ranges extend to the eastern coast, where there are magnificent cliffs with sheer drops of hundreds of feet, particularly in the northern part of the island. Toward the west, the mountains decrease in height and gradually give way to a plain that extends to the sea and stretches from the northern to the southern end of the island. The northern parts of this plain are somewhat elevated and undulating, with hills jutting into it. In its central and southwestern parts it is broader and more level (fig. 1).

Administratively, Taiwan is divided into 7 Provinces. Five of these—Taihoku, Shinchiku, Taichu, Tainan, and Takao—each include within their boundaries a portion of the western coastal plain. Two—Taito and Karenko—are entirely within the mountainous part. The total population in 1939 was placed at 5,895,864 persons, which means an average density of about 425 per square mile: but density was considerably higher in the first-mentioned 5 Provinces, where around 95 percent of the population were living. A large proportion, estimated at about 93 percent of the total, are of Chinese descent. Japanese make up only 5 or 6 percent. In the mountain fastnesses live some 150,000 aborigenes, a part of whom still resist Japanese authority. Approximately 50 percent of the total households are farm households.

Climate

The climate of the cultivated portions of the island is largely subtropical and tropical. Average monthly temperatures at Koshun, on the southern tip, are similar to those of Miami, Florida, and the temperatures in general resemble those of the southern half of Florida. At higher altitudes in the mountains, temperate-zone conditions may be found.

Several different types of rainfall conditions may be distinguished. Along the eastern coast of the northern tip of Taiwan, rainfall is heavy during the winter months but often light for a month or two during the summer. At a quite short distance toward the west, however, a marked difference in the type of rainfall occurs. In Tansui, rainfall is distributed rather evenly through the year; but, in Taihoku, precipitation is light between November and January and heavy between May and September. In Shinchiku, dryness between November and January is still more marked: and from Taichu southward there is little rain between October and February. In Tainan and Takao the months of March and April are also dry, but substantial rains usually fall from May through September. The total annual fall varies from as low as 40 inches to over 200 (fig. 2). Typhoons may occur from May through November, causing severe damage to crops, especially in the southwestern part of the island (*7*).[1]

Agriculture the Chief Industry

Before the war, in addition to supplying most of its own needs for foodstuffs, Taiwan supplied rice to

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*Office of Foreign Agricultural Relations.

[1] Italic numbers in parentheses refer to Literature Cited, p. 12.

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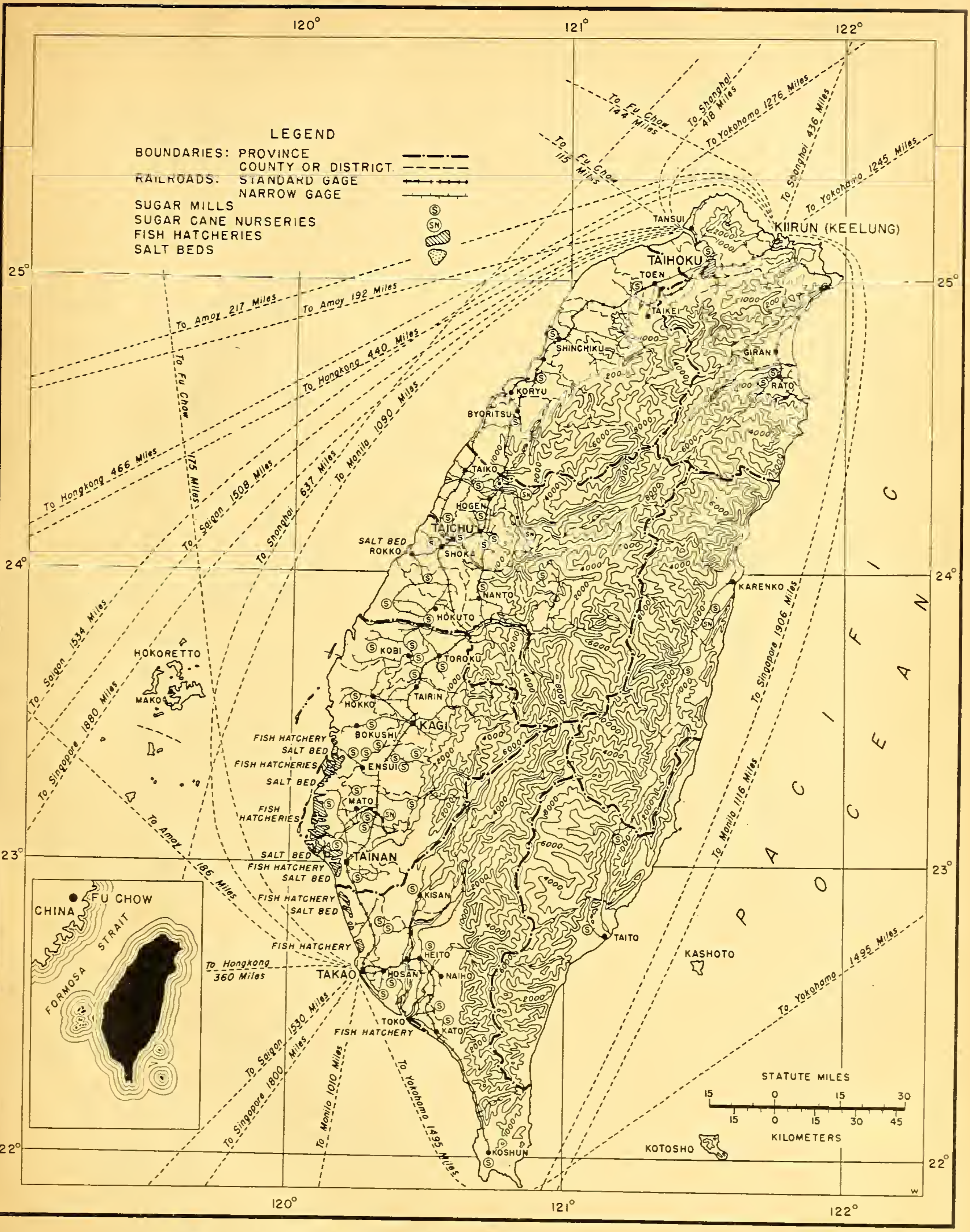

FIGURE 1.—Map of Taiwan (Formosa) showing relief, drainage, and shipping routes.

Japan amounting to about 6 out of the 20 percent imported to meet Japan's total rice requirements. Taiwan's output of sugar was sufficient to supply the major part of the needs of the entire Japanese Empire. In addition, large quantities of fruits and dried sweetpotatoes were shipped to Japan, and substantial quantities of tea and oranges were exported elsewhere.

Within Taiwan, during the years 1932–37, the annual average value of all crops and livestock products made up about 50 percent of the total value of all production. Sugar made up another 24 percent, and other forms of processed foodstuffs accounted for 7 percent. The combined value of agricultural products and products manufactured from agricultural materials therefore constituted about 81 percent of the total value of production. During the same period, exports of these commodities represented about 86 percent of the value of total exports (*1*).

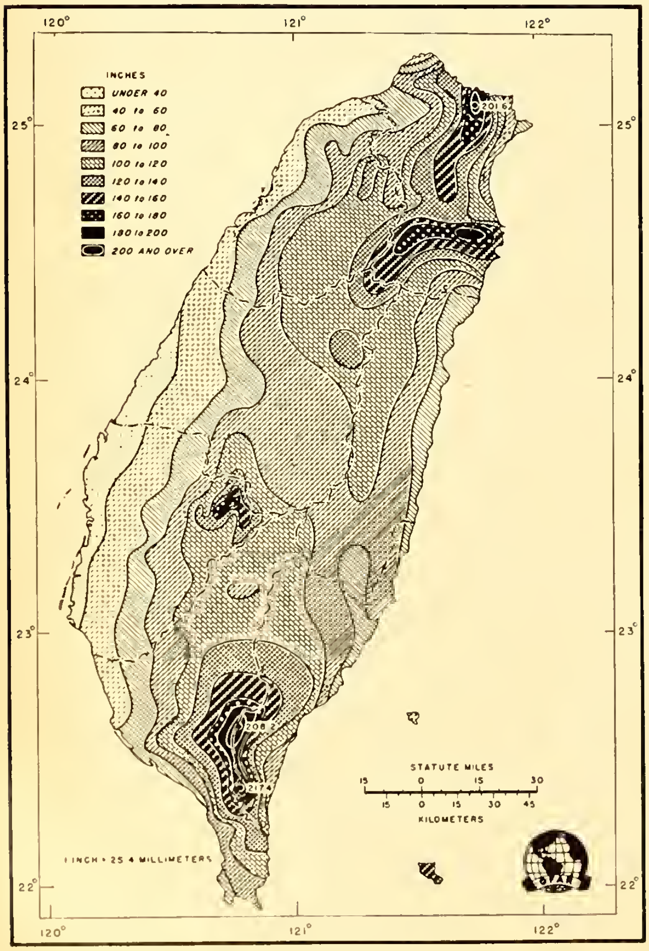

Figure 2.—Distribution of rainfall in Taiwan.

ARABLE LAND

The total amount of land cultivated in 1939 was reported to be 2,124,000 acres, or about 24 percent of the total land surface. Approximately 94 percent of the cultivated area is in the 5 Provinces that touch on the western plain; most of the remainder is in a narrow elongated valley somewhat inland from the east coast.

Table 1.—*Land under cultivation in Taiwan, by Provinces, 1939*

Province	Irrigated land				Dry farms	Grand total
	2-crop acreage	First-crop acreage	Second-crop acreage	Total		
	1,000 acres	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*
Taihoku	131	5	5	141	89	230
Shinchiku	210	5	(1)	215	151	366
Taichu	253	1	11	265	160	425
Tainan	55	8	400	463	191	654
Takao	109	5	67	181	139	320
Taito	16	2	(1)	18	24	42
Karenko	25	2		27	42	69
Boko [2]					18	18
Total	799	28	483	1,310	814	2,124

[1] Less than 500 acres.
[2] A Province of the Pescadores Islands.

Compiled from TAIWAN NOJIHO (*1*).

About 38.3 percent of the total amount cultivated was in upland fields, without irrigation; 61.7 percent was irrigated. Land that can be irrigated in all seasons, so that two crops of rice may be raised on it, is known as "two-crop land." Of a total of 1,310,000 acres of irrigated land, 799,000 acres were of this type. Land that can be irrigated only when the first crop is being grown is known as "first-crop land," of which there were 28,000 acres. The remainder, 483,000 acres, can be irrigated only when the second crop is grown, and this is known as "second-crop land." (See table 1.) Obviously, these types are related to the rainfall conditions and to the time when irrigation water is available.

SOILS

The soils of Taiwan may be divided into two general groups. The first group occurs in the northern part of the island on elevated terraces (diluvial), on which the soils are older and more fully weathered. They are brown-red in color and acid. Most of the soils of Shinchiku and Taihoku Provinces are of this kind. They are largely devoted to rice. These also are the soils on which tea is grown.

In central and southern Taiwan the coastal plain is a succession of more or less steep alluvial fans, and the soils are of more recent origin, mainly alluvial. Since they contain large amounts of unweathered rock particles, their color tends to be grayish, and their mineral content remains high. In reaction they are alkaline or neutral. In general they are fertile, although, like all tropical soils, they are low in organic matter (*6* and *8*). These soils produce most of the sugarcane.

Within the alluvial fans, however, cobblestone washes and stretches of sandy soil often appear. Near the coast, also, there are areas of saline soils. The salts in certain spots appear to be largely sodium chloride, due to an infiltration of sea water. In other areas, sulphates, carbonates, and bicarbonates predominate. The total amount of land containing salts in injurious concentrations is reported to amount to about 24,000 acres.

LANDHOLDINGS AND SIZE OF FARMS

Certain crops of Taiwan, particularly sugarcane and pineapples, are raised in part on plantations. The amount of land in plantations has not been made public, but it was reported, in 1930, that 30.1 percent of all cultivated land was in farms above 12 acres in size. The land in plantations would no doubt be something less than this figure.

The remainder of the land is farmed by independent operators. Most of these operators farm on a small scale with simple farm equipment, using the water buffalo as draft animal, employing a great deal of hand labor, and treating the fields practically as gardens. For the country as a whole, the average size of farm is calculated to be around 5 acres, taking all land into account. Because of the land in large holdings, most farmers are not so well off. In 1930, approximately 53 percent cultivated less than 2.4 acres of land. Around 30 percent cultivated less than 1.2 acres, including land owned and rented. Although, on the one hand, 4.5 percent of the operators controlled 30.1 percent of the land, on the other hand, 30.3 percent of the farmers farmed only 4.9 percent of the total amount of land cultivated (*4*).

TENURE

The situation with respect to tenancy also is unfavorable to a large number of farmers. In 1939, about one-third of all farm households owned the land they cultivated. Somewhat more than one-third were full tenants, and the remainder owned part and rented part of their land. Of all the irrigated land, about 61 percent was cultivated by tenants; owners cultivated 39 percent. Of the dry land, which is less profitable to the landlord, about 60 percent was tilled by owners (*1*).

These conditions are better than those that prevailed 15 years earlier, when troubles arising out of tenant-landlord relationships brought about something of an organized effort by tenant farmers to improve their conditions. Stimulated by this situation, the Government promoted the organization of tenant-farmer associations, which included in their membership both tenants and landlords. These worked for the improvement of tenants' farm practices, arbitrated in farmer-landlord disputes, and promoted written contracts. Present conditions, however, cannot be considered satisfactory for a large number of farmers; when tenancy and the large number of small farms are both considered, many farm households appear to be living at only a subsistence level.

IMPORTANT FEATURES IN FARM PRACTICES

An outstanding characteristic of Taiwan's agriculture is the large total production in relation to the small amount of land available for cultivation. Three farm practices appear to be mainly responsible for the large output.

Multiple Cropping.—Land in Taiwan often carries more than one crop per year. In the case of rice, two crops are commonly planted on the same piece of land. In some cases, the second crop of rice may be followed by a crop of wheat, making three major crops on one piece of land per year. Vegetables, beans, and other crops may also follow rice, and similar crops may follow main crops on upland fields when moisture is sufficient.

In 1938, the total number of acres planted was reported to be 2,947,000,[2] excluding the acreage in green-manure crops, as compared with 2,120,000 acres under cultivation. Thus, the number of acres planted was about 39 percent more than the number of acres actually cultivated. If the land in sugarcane, which may occupy the same acreage up to 18 or 20 months, is left out, the number of acres planted was 47 percent greater than the total cultivated.

Irrigation.—Probably the most important controllable factor behind the high level of production is irrigation. In 1939, about 62 percent of all the land under cultivation was irrigated, and almost all the paddy fields were watered under a system of artificial irrigation. This is of unusual importance during the dry season where crops would be impossible without irrigation. Between the years 1915 and 1939, the total production of rice nearly doubled; and there is reason to believe that an expansion of the irrigation facilities, which occurred during the same period, was the most important factor responsible for this increase.[3]

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[2] WARNER, GERALD. TAIWAN'S ARABLE LAND, LAND VALUES, FARM POPULATION AND AGRICULTURAL PRODUCTION IN 1938. U. S. Cons. Rpt. 8 pp., illus. Taihoku. Jan. 25, 1940. [Typewritten.]

A systematic effort to develop irrigation facilities was first begun about 1908. Since then the facilities have been greatly expanded. Some systems are of a very simple nature, local in scope. Others are of large size, with reservoirs, an extensive distribution system, and accompanying drainage. The best known of these systems is the one for which water is supplied by the Coral Reservoir, reported to be the largest in the Far East. This reservoir is said to be 140 feet deep at its deepest point, to have a capacity of 5.5 billion cubic feet of water, and to provide water for the irrigation of about 360,000 acres of land.

Fertilization.—Fertilizers play an extremely important part in the agriculture of Taiwan. Multiple cropping would quickly exhaust the soil were no provisions made to replenish its stock of essential nutrients. Furthermore, experimental evidence has fully demonstrated that the soils are very responsive to the application of fertilizers. A series of experiments with sugarcane, carried out at 33 different stations in 8 Provinces, showed that, on the average, the yield of plots receiving no fertilizer was only 45.1 percent of the yield of plots on which a complete fertilizer (containing nitrogen, phosphorus, and potash) was applied. When nitrogen only was lacking, the yield was 53.6 percent of the completely fertilized plots; with phosphorus lacking, it was 84.1 percent; and with potash lacking, 87.7 percent (*2*). Experiments with rice and wheat gave similar results. The evidence everywhere is conclusive, at least, that the application of nitrogen results in marked increases of yield.

Table 2.—*Acreage and production of principal crops in Taiwan, average 1931–35, annual 1939*

Crop	Average 1931–35		1939	
	Acreage	Production	Acreage	Production
	1,000 acres	*1,000 short tons*	*1,000 acres*	*1,000 short tons*
Cereals:				
Paddy rice [1]	1,566	1,327	1,488	1,443
Upland rice [1]	103	59	59	32
Total rice [1]	1,669	1,386	1,547	1,475
Wheat	2	1	12	6
Barley	1	1	3	1
Foxtail millets	5	1	5	1
Proso millets	9	1	8	1
Corn	4	2	4	2
Legumes:				
Soybeans	19	5	13	4
Other beans and peas	27	6	24	5
Peanuts	73	30	72	31
Roots and tubers:				
Sweetpotatoes	333	1,649	312	1,410
Radishes (Daikon)	14	80	18	80
Taros	(2)	(2)	4	15
Cassava	(2)	(2)	14	98
Other vegetables	(2)	(2)	75	326
Fruits:				
Citrus	(2)	33	12	39
Bananas	(2)	193	48	201
Pineapples	(2)	[3] 89	26	[3] 146
Longan	(2)	8	6	6
Industrial crops:				
Sugarcane	244	7,341	401	14,134
Jute	10	8	57	26
Ramie	4	1	5	1
Sesame	9	1	8	1
Tobacco	2	2	5	4
Cotton	(2)	(2)	8	1
Castor-beans	(2)	(2)	14	2
Sisal hemp	(2)	(2)	3	1
Tea	108	11	111	15

[1] In terms of brown rice.
[2] Data not reported.
[3] Thousand pineapples.

Figures for 1931–35 compiled from the [JAPANESE] STATISTICAL ABSTRACT OF THE MINISTRY OF AGRICULTURE AND FORESTRY (*5*); for 1939, from TAIWAN NOJIHO (*1*).

Among the fertilizers consumed, green manure was significant. Farm-supplied fertilizers, such as stable manure, compost, night soil, and wood ashes, were also fully utilized. Of the commercial materials, around 200,000 short tons of bean cake were imported annually from Manchuria; and the use of mineral fertilizers increased rapidly, especially during the decade prior to Pearl Harbor. Taking all forms together, the quantities of fertilizers consumed during 1938 are estimated to have provided for each acre of crops planted an average of 90 pounds of nitrogen, 41 pounds of phosphoric acid, and 28 pounds of potash, or the equivalent of about 450 pounds of ammonium sulphate, 200 pounds of superphosphate (20 percent P_2O_5), and 56 pounds of potassium sulphate. Some 50 percent of the nitrogen is estimated to have come from chemical fertilizers, mainly from imported ammonium sulphate. Another 9 percent came from seed cakes, chiefly bean cake; so it may be roughly estimated that one-half of all the nitrogen applied to crops during 1938 was imported. In the case of phosphoric acid, a little less than half came from chemical materials, largely superphosphate, of which a part was manufactured in Taiwan; and somewhere around 40 percent of the total phosphorus applied came from imported materials. Of potash, approximately 80 percent came from farm-supplied materials.[4]

Crop Production

RICE

Rice is easily the most important single crop of Taiwan (table 2). In 1939, 1,547,000 acres were planted, or a little more than half the number of acres in all crops. The amount of land on which rice actually appeared is estimated at approximately 900,000 acres. With the possible exception of Tainan, which is a heavy sugarcane-producing Province, rice is the leading crop in every Province (table 3). For the farmer, rice forms a staple article of diet. It also is the main source of cash income—around one-half the total crop is exported, and more than that proportion is undoubtedly sold off the farm.

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[3] Warner, Gerald. irrigation in taiwan. U. S. Cons. Rpt. 7 pp., illus. Taihoku. Sept. 21, 1938. [Typewritten.]

[4] Calculated by Office of Foreign Agricultural Relations from data in taiwan nojiho (*1*).

Table 3.—*Reported acreage of the principal field crops of Taiwan, by Provinces, 1939*

Province	Rice	Sugar-cane	Sweet-potatoes	Tea	Peanuts	Soybeans	Other beans	Wheat
	1,000 acres	*1,000 ocres*	*1,000 acres*	*1,000 acres*	*1,000 ocres*	*1,000 acres*	*1,000 ocres*	*1,000 ocres*
Taihoku	239	9	29	48	2	(1)	(1)	(1)
Shinchiku	345	29	42	61	7	-------	(1)	(1)
Taichu	377	90	45	2	8	3	2	11
Tainan	303	184	134	(1)	33	1	18	(1)
Takao	209	66	49	(1)	7	8	3	-------
Taito	31	6	3	-------	2	(1)	(1)	-------
Karenko	43	17	4	(1)	4	1	(1)	(1)
Boko	-------	-------	6	-------	9	-------	(1)	-------
Total	1,547	401	312	111	72	13	24	12

[1] Less than 500 acres.

Compiled from data in TAIWAN NOJIHO (*1*).

Nearly all the rice is grown in paddy fields, under irrigation. Less than 4 percent, in 1939, was upland rice grown without irrigation. Seed for the first crop of paddy rice is planted in seedbeds in February or March and transplanted into the fields in March and April. This crop is harvested in June and July. The second crop is transplanted into the fields almost immediately and is harvested during October and November. In 1939, about 43 percent of the total acreage was in the first crop and 57 percent in the second.

Both glutinous and ordinary (nonglutinous) forms are grown, but about 90 percent is ordinary rice. Slightly more than half the total acreage is of a special type known as Horai rice, grown to meet the demands of the Japanese market. This is a round-grain type, in contrast with the long-grain type preferred by the Formosan Chinese.

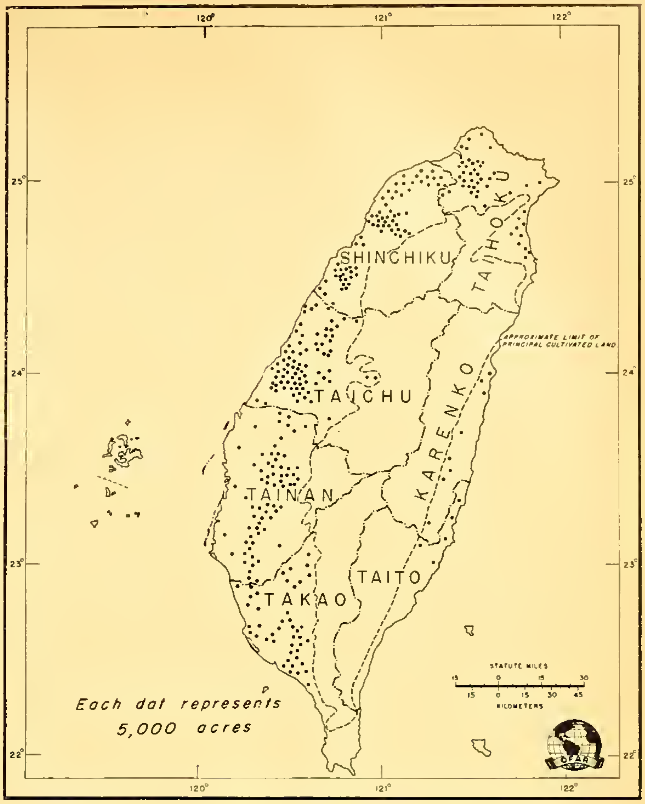

Figure 3.—Distribution of rice acreage (1937) in Taiwan.

Quantity figures for rice in Taiwan, as in Japan and Korea, are given in terms of brown rice (husked but unmilled). Annual production for the 5-year period 1935–39, in these terms, averaged 1,512,000 short tons (table 4). This is the equivalent of about 1,919,000 short tons of rough rice,[5] which would indicate an average yield per acre of about 52.8 bushels of rough rice. For comparison, average yields during the same period of other rice-producing countries, in bushels of rough rice per acre, were: Japan

Table 4.—*Rice production, foreign trade, and amounts available for domestic utilization, 1929-39*

Year	Acreage	Production	Imports			Exports				Net export [2]	Available for domestic utilization [3]
						Japan		Abroad	Total		
			Abroad	Japan	Total	Brown	Polished [1]				
	1,000 acres	*S. tons*	*S. tons*	*S. tons*	*S. tons*	*S. tons*	*S. tons*	*S. tons*	*S. tons*	*S. tons*	*S. tons*
1929	1,403	1,044,773	91,070	1,670	92,740	331,793	18,698	21	350,512	257,772	787,001
1930	1,518	1,188,211	11,286	1,124	12,410	312,710	17,750	12	330,472	318,062	870,149
1931	1,566	1,205,837	913	1,144	2,057	422,970	36,012	8	458,990	456,933	748,904
1932	1,641	1,442,716	24,735	13,671	38,406	557,219	29,065	416	586,700	548,294	894,422
1933	1,669	1,348,024	7,124	1,100	8,224	562,034	44,323	477	606,834	598,610	749,414
1934	1,648	1,465,232	-------	1,132	1,132	742,312	70,158	805	813,275	812,143	653,089
1935	1,677	1,470,595	-------	1,043	1,043	629,432	57,559	212	687,203	686,160	784,435
1936	1,684	1,540,922	-------	994	994	707,324	60,059	45	767,428	766,434	774,488
1937	1,625	1,488,485	-------	1,039	1,039	708,289	58,600	132	767,021	765,982	722,503
1938	1,545	1,582,596	-------	2,284	2,284	678,170	43,948	11,131	733,249	730,965	851,631
1939	1,547	1,475,365	-------	1,052	1,052	574,891	58,607	14,766	648,264	647,212	828,153

[1] In terms of brown rice; polished × 1.2=brown.
[2] Total export minus total import.
[3] Production minus net export.

Compiled from data in TAIWAN NOJIHO (*1*).

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[5] $\frac{\text{Brown rice}}{.7878}=\text{Rough rice.}$

proper—75.4; China (average 1931–37)—50.3; Philippine Islands—21.3; Indochina—22.1; Thailand—30.1; Burma—27.8; India—26.5; and the United States—49.8. Japan, as commonly known, is first in this respect. Taiwan, although its rice land is often double-cropped, is second. Compared with the important rice-producing countries of southeast Asia, Taiwan's yields are excellent and about twice the average yields of the Philippine Islands, Indochina, Burma, and India.

SUGARCANE

Some sugarcane is grown in all the Provinces, but Tainan is the most important center of production. Large quantities are also grown in the adjoining Provinces of Taichu and Takao. The cane is usually planted between June and November and harvested about 18 months later. Presumably, ratoon crops also are harvested subsequently. A considerable amount of land in sugarcane is in large plantations, on which power equipment is commonly used. Plowing is done with steam tractors which with a cable pull large plows, penetrating 1 to 2 feet deep.

Otherwise, the cane is grown by independent growers who enter into a definite contract with the sugar companies. These contracts cover the price to be paid for the product, as well as a great many details concerning fertilizer, cultivation practice, and time of delivery. Fifty-one sugar mills of varying capacity were known to exist before the war, more than half of which were also equipped to produce alcohol. The mills were located in appropriate places in the various cane-growing regions, and an extensive system of narrow-gage railways was built to haul cane to the mills.

TABLE 5.—*Acreage, production, and yield of sugarcane in Taiwan, with production and export of sugar, 1929–39*

Year	Acreage	Production	Yield per acre	Production of sugar	Export of sugar
	1,000 acres	*1,000 short tons*	*Short tons*	*1,000 short tons*	*1,000 short tons*
1929	288	8, 130	28	870	811
1930	262	7, 681	29	893	819
1931	237	7, 239	31	879	885
1932	262	8, 873	34	1, 090	970
1933	202	5, 828	29	699	654
1934	218	5, 876	27	713	727
1935	291	8, 914	31	1, 064	1, 000
1936	308	8, 721	28	994	966
1937	299	9, 439	32	1, 110	1, 007
1938	322	9, 988	31	1, 091	1, 095
1939	401	14, 134	35	----------	1, 445

Compiled from TAIWAN NOJIHO (*1*).

The land planted to sugarcane in 1939 was reported to be 401,000 acres, the highest acreage on record. Sugarcane and rice are often considered competing crops, particularly for land that can be irrigated. During recent years the policy of the Government General has been to encourage the production of sugarcane. Various measures were put into effect favoring the sugarcane growers, but making it more difficult for the growers of rice, in order to achieve the balance desired between the two crops. Farmers, on the other hand, often preferred to raise rice, because it seemed a more profitable crop. Within the decade between 1929 and 1939, there was a considerable variation in acreage (table 5), depending on the relative need in Japan for sugar and rice.

Before the war, approximately 35 percent of the total acreage was irrigated. During most years, this would have meant somewhere between 100,000 and 140,000 acres, with the rest in upland fields. Approximately 103,000 acres of 2-crop land were reported in sugarcane during the first part of 1939, but, beginning with the summer planting of that year, 24,000 acres of this were to be taken out of sugarcane and used for rice production.

The total production of sugarcane is reported without distinction as to the quantities harvested from first cuttings and those from ratoon crops. Production has varied with acreage, from a low of 5,828,000 short tons to a high of 14,134,000. The amount of sugar produced varied likewise, from 699,000 to 1,091,000 short tons, according to figures available through 1938. Considering the unusually large production of cane in 1939, the production of sugar in that year undoubtedly was still higher (table 5).

SWEETPOTATOES

From the point of view of acreage and total value of production, the sweetpotato is the third most important crop in Taiwan. In 1939, 312,000 acres were planted to this crop. For the 5-year period 1935–39 the acreage averaged 335,000 acres. Sweetpotatoes are raised in large quantities in every Province, but a little over 40 percent are raised in Tainan alone, where an unusual proportion of the crop is used for other than direct food purposes. This crop is planted almost entirely on upland fields, in well-drained soils of a medium to light texture. In 1938, only 13,000 acres, or 4 percent of the total, were irrigated.

Production during the 1935–39 period averaged 1,790,000 short tons. This crop is utilized in a number of different ways. A large portion is dried, the amount during this period being nearly 40 percent of total production. A large quantity of the dried product has been shipped to Japan to be used in the making of alcohol. Still larger quantities have been retained in Taiwan, presumably for the same purpose. A relatively small, though rapidly increasing quantity, was used in Taiwan for the manufacture of starch. The balance, estimated at somewhere around 1,160,000 short tons for the period 1935–38, was utilized in a fresh state. An unreported proportion of this balance is used as feed for swine; the rest is utilized for human consumption (table 6).

TABLE 6.—*Production and utilization of sweetpotatoes in Taiwan, 1929-39*

Year	Production	Processed						Balance
		Dried			Starch		Total in fresh equivalent	
		Exported to Japan	Total produced		Quantity manufactured	Fresh[2] equivalent		
			Dried	Estimated fresh [1]				
	1,000 S. tons	*1,000 S. tons*	*1,000 S. tons*	*1,000 S. tons*	*1,000 S. tons*	*1,000 S. tons*	*1,000 S. tons*	*1,000 S. tons*
1929	1,302	12	102	452	1	3	455	847
1930	1,466	11	107	477	1	4	481	985
1931	1,591	29	103	458	1	5	463	1,128
1932	1,580	2	108	478	1	3	481	1,099
1933	1,558	21	123	548	1	5	553	1,005
1934	1,726	42	114	507	2	9	516	1,210
1935	1,790	29	129	572	3	11	583	1,207
1936	1,898	39	134	594	3	11	605	1,293
1937	1,951	72	188	834	7	30	864	1,087
1938	1,903	78	185	821	7	28	849	1,054
1939	1,410	13	--------	--------	15	57	--------	--------

[1] Dried×4.44=fresh. Estimated on basis that 2,000 lbs. of potatoes from the field will produce about 450 lbs. of dried, allowing from 16–20 percent loss in peeling and handling.

[2] Starch×4=fresh sweetpotatoes, assuming that the yeild of starch averages 25 percent.

Calculated from data in TAIWAN NOJIHO (*1*).

TEA

Although tea is a great deal less important in Taiwan than rice, sugarcane, or sweetpotatoes, the amount of land devoted to it and the value of its export are significant. The total acreage in 1939 was 111,000 acres. Practically all this was found on terraced slopes in the two northern Provinces of Taihoku and Shinchiku, where it is grown on plantations largely in Japanese hands (table 2). Attempts have been made to raise it in locations toward the south, but the present acreage is small. It seems peculiarly suited to the reddish acid soils and the climatic conditions that prevail in the north. Total production in 1939 was reported at 15,000 short tons.

Three general types of tea are manufactured in Taiwan. The first of these is Oolong tea, long known in the United States, which has absorbed a large proportion of the quantity exported. This is a semi-fermented type, formerly the most important produced, but more recently the demand for it has declined. The second type is known as Pouchong, which is also a partially fermented type, but which is scented. Somewhat less of this type was formerly produced than of Oolong, but its production has in general been maintained. Black tea has been produced in response to the requirements of the world market, which preferred it to green or partially fermented types. Although produced in only small quantities around 1930, by 1939 it had become the most important type.

MINOR CEREALS AND LEGUMES

With the exception of rice, cereals are of minor importance in Taiwan. Some millet is grown, largely in the Pescadores Islands. Small amounts of barley and corn are also produced. Wheat is somewhat more important because of a strong market demand for this commodity. This crop has been raised during the winter after the second crop of rice, by planting between rice rows before harvesting. Recent breeding work has developed short-seasoned rice and wheat varieties so that the winter interval between rice crops is long enough to mature the early maturing wheat. As a result of these improvements, the acreage in wheat rose sharply in 1939 to almost 12,000 acres, or more than 4 times the acreage of the previous year. (See table 2.)

The peanut is the most important legume grown. This crop is particularly well suited to the sandy soils found throughout the cultivated areas. Roughly one-fourth of the total output is pressed for oil, and the remainder is apparently consumed as nuts. A total of 72,000 acres was reported in this crop in 1939, with a production of about 31,000 short tons.

Beans of various kinds are raised in small quantity. Miscellaneous types were planted in 1939 on about 24,000 acres, more than half of which were in the Province of Tainan. In earlier years about an equal acreage was in soybeans, but this declined to 13,000 acres in 1939. Apparently it was found more suitable to import soybeans and to devote more land to crops for which Taiwan's soils and climate are particularly adapted.

VEGETABLE CROPS

In 1939, about 96,900 acres were reported in vegetable crops other than sweetpotatoes. This provides an average of 0.0164 acre of vegetable crops per person for the entire population of Taiwan. For the United States, excluding the acreage of Irish potatoes and sweetpotatoes and the land in home gardens, the average was 0.0225 acre at about the same time. The principal types grown include Daikon radishes, head cabbage, Taiwan rape, garlic, taros, onions, melons, gourds, celery, cucumbers, eggplant, leeks, Chinese cabbage, string beans, peas (probably a cowpea), and pumpkins. Such crops as radishes, mustard, eggplant, string beans, and carrots may be planted either sometime between January and April or between October and December. Cabbage, Irish potatoes, peas, cauliflower, bulb onions, and tomatoes can usually be raised only if planted in the fall or early winter, or at higher elevations. Watermelons, other melons, and taros are summer crops (*9*). As in Florida, the winter months are the months of greatest production.

FRUIT CROPS

Conditions in Taiwan are excellent for the production of a large variety of tropical and subtropical fruits. The largest acreage is in bananas, of which there were 48,000 acres reported for 1939 (table 7). More than half this amount was found in Taichu Province, where there were large plantings in the hills. In Takao Province there was a considerable acreage on irrigated plantations on the plains. Production in 1939 was reported at about 201,000 short tons.

Pineapples were raised on plantations for canning. The growers had hoped that eventually Formosan pineapples would compete on the world market. In 1939, about 26,000 acres were reported, more than half of which were in Taichu Province. Citrus fruits of various types are grown throughout Taiwan, but especially in the northern Provinces of Taihoku and Shinchiku. The citrus are of two main types: one is the tangerine, and the other the pomelo, which somewhat resembles the grapefruit. There are several varieties of both types. Attention recently has been given to the development of Valencia oranges, grapefruit, and lemons, the prospect for lemons appearing particularly hopeful. Some papayas and mangoes are grown, largely in Takao Province, and there are a number of other fruits consumed locally, such as longans and pomegranates. In the north, some plums, peaches, persimmons, and grapes are also raised.

TABLE 7.—*Reported acreage of principal fruits in Taiwan, by Provinces, 1939*

Province	Bananas	Pineapples	Total citrus	Mangoes	Plums	Persimmons
	Acres	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*
Taihoku	436	229	3,652	7	257	117
Shinchiku	1,024	230	4,147	10	295	429
Taichu	29,670	14,991	1,975	77	1,460	139
Tainan	5,838	3,708	1,350	1,067	209	307
Takao	9,953	6,435	348	261	17	------
Taito	992	29	108	12	10	14
Karenko	290	55	213	2	36	22
Boko	2	--------	1	--------	--------	--------
Total	48,205	25,677	11,794	1,436	2,284	1,028

Calculated from data in TAIWAN NOJIHO (*1*).

OTHER CROPS

During recent years the Government has promoted the production of certain crops considered essential to Japan's war effort. Considerable attention was given to cotton, with poor success. The production of castor-beans for oil has been greatly expanded. Special attention has been given to jute; and tobacco, ramie, and sisal hemp have been developed. Some of these, such as jute, may survive the war, but others will probably drop out in favor of crops better adapted to the existing environment.

Livestock Production

The livestock industry of Taiwan is featured by relatively large numbers of swine and poultry (table 8). The number of swine per farm household in 1939 averaged 2.9 head as compared with 0.2 for Japan and 1.1 for the three Provinces of southeast China: Chekiang, Fukien, and Kwangtung. All kinds of poultry averaged about 21 birds per farm household. Japan had 9.5; the three Provinces of China averaged 5.5.

TABLE 8.—*Total number of principal types of livestock in Taiwan, by Provinces, 1939*

Province	Water buffaloes	Other cattle	Swine	Goats	Chickens	Ducks	Geese	Turkeys
	Thousands	*Thousands*	*Thousands*	*Thousands*	*Thousands*	*Thousands*	*Thousands*	*Thousands*
Taihoku	29	1	152	2	925	369	14	9
Shinchiku	31	14	287	8	1,738	627	111	8
Taichu	41	8	226	16	1,373	503	207	14
Tainan	79	15	665	34	1,415	241	42	7
Takao	58	13	256	4	997	138	9	2
Taito	11	4	19	(1)	71	11	2	(1)
Karenko	17	(1)	29	(1)	123	40	5	1
Boko	--------	4	19	(1)	38	2	(1)	(1)
Total	266	59	1,653	64	6,680	1,931	390	42

[1] Less than 500.

Calculated from data in TAIWAN NOJIHO (*1*).

One reason for the large number of swine is the presence of byproducts of food-manufacturing industries for which there is no other good use. Swine also produce fertilizer, their yards containing excavated pits into which are dumped cane trash, rice straw, and other forms of organic matter for bedding. The resulting material, after allowing time for decomposition, is found quite beneficial to cane soils. Of a total of 1,653,000 head reported for 1939, 73,000 were classified as native, 28,000 as foreign, and 1,552,000 were crossbreeds.

Aside from water buffaloes, used mainly for work purposes, the number of cattle is small. Dairy cows numbered only 1,445 in 1939. Chickens were reported to total 6,680,000, and there were also 1,931,000 ducks, 390,000 geese, and 42,000 turkeys (table 8). Fowl cholera was a serious disease a decade ago, but a sharp decline in its incidence during recent years suggests that successful measures have been devised to meet it.

Official slaughter records show the number of animals slaughtered and a figure for weight. It is not clear from the record whether the weight figure refers to the live animal or to its dressed carcass. Some reason is seen to interpret it as the weight of the live animal. If such is the case, the amount of dressed pork available per person in 1939 would have been, on the average, about 25 pounds. If the figure refers to weight of carcass, the average would be about 33 pounds. In either case, the figure is high compared with amounts of meat available in most countries of that part of Asia. The chickens and ducks raised would provide large additional quantities of animal-protein foods.

Foreign Trade in Agricultural Products and Foodstuffs

The general situation with respect to foreign trade in agricultural products and foodstuffs is summarized in table 9. From the point of view of foodstuffs, Taiwan is a net exporter. Sugar has been the most important export item. During 1933–37, the annual export averaged about 871,000 short tons. This increased during subsequent years to reach 1,445.000 tons in 1939 (table 5).

Rice has been the second most important item in the export trade (table 4). Exports for the 5-year period averaged 727,000 short tons, in terms of brown rice, or in terms of rough rice, about 923,000 short tons. Almost the entire output has gone to Japan. Other important food and agricultural items exported have been bananas, citrus fruits, fresh and canned pineapples, dried sweetpotatoes, and tea. About 122,000 short tons of salt were exported annually (table 9).

The foodstuff items imported in greatest quantity were wheat and wheat products and soybeans and soybean products. During the period 1933–37 an average of about 53,000 short tons of wheat and wheat flour in terms of wheat were imported. The import of soybeans during the same period was nearly 45,000 short tons. There were an additional 6.500 short tons of other beans and peas and an average annual import of 966.000 gallons of soy sauce. An average of 23.600 short tons of salted and dried fish was imported, although there was a net export of 5.400 tons of fresh and shellfish. There also was a net import of condensed milk

TABLE 9.—*Foreign trade of Taiwan in important agricultural products and foodstuffs, average 1933–37*

Item	Net exports			Net imports			Balance	
	Abroad	Japan	Total	Abroad	Japan	Total	Export	Import
Grain and Products:	*S. tons*	*S. tons*	*S. tons*	*S. tons*	*S. tons*	*S. tons.*	*S. tons*	*S. tons*
Rice (brown)	364	727,005	727,369				727,369	
Wheat				1,904	13,645	15,549		15,549
Wheat flour (as wheat)					37,059	37,059		37,059
Total wheat						52,608		52,608
Soybeans	1	952	953	42,786	2,946	45,732		44,779
Other beans and peas	62	1,337	1,399	5,596	2,351	7,947		6,548
Wheat bran				51,949	2,917	54,866		54,866
Fruits:								
Bananas	16,523	132,946	149,469				149,469	
Oranges	7,358	2,192	9,550				9,550	
Pineapples, fresh	691	1,639	2,330				2,330	
Pineapples, canned	[1] 423	[1] 2,624	[1] 3,047				[1] 3,047	
Peach and pear	991		991	62		62	929	
Watermelon	1,425	1,578	3,003				3,003	
Shaddock and pomelo	279	643	922				922	
Vegetables:								
Sweetpotatoes, dried	64	40.778	40,842	317		317	40,525	
Starches of potatoes					3,112	3,112		3,112
Bamboo sprouts, dried	281	643	924				924	
Onions					5,260	5,260		5,260
Garlic				919		919		919
Fish:								
Fresh and shellfish	428	7,057	7,485		2,110	2,110	5,375	
Salted and dried	4,578		4,578	5,181	23,006	28.187		23,609
Cuttle, dried	496		496		1,757	1,757		1,261
Shrimp and prawns, dried	155		155	35	1,496	1,531		1,376
Sugar	24,052	850,250	874,302		3,538	3,538	870,764	
Molasses	71	34,376	34,447	2,663		2,663	31,784	
Tea:								
Oolong	3,469	6	3,475				3,475	
Pouchong	2,733	312	3,045				3,045	
Black	2,907	480	3,387				3,387	
Miscellaneous:								
Soy sauce	[2] 2		[2] 2		[2] 968	[2] 968		[2] 966
Salt	9,142	112,973	122,115				122,115	
Condensed milk				[1] 1	[1] 409	[1] 410		[1] 410
Sisal hemp		381	381				381	
Jute	236	1,533	1,769	2,115		2,115		346

[1] 1.000 dozen cans.
[2] 1,000 gallons.

Compiled from ANNUAL RETURNS OF THE TRADE OF TAIWAN (FORMOSA), (*3*).

averaging 410,000 dozen cans. All these are significant items. Fish and soybeans would probably be considered the most important, because they are used by a large proportion of the population. Wheat flour and wheat may in a sense be thought of as a luxury, rather than as a critical item, eaten through preference by a limited part of the population. The large import of soybean cake and chemical fertilizers has already been mentioned.

Problems Following Liberation

Until more is known about the course that fighting will follow in the Pacific, little can be predicted about the agriculture and food-supply situation to be expected upon liberation.

If we assume, however, that major military operations will take place over Taiwan, serious damage affecting agricultural production may be expected of at least the following important kinds: Damage to sugar mills and other facilities connected with the manufacture of sugar from sugarcane; damage to reservoirs, dams, canals, and other structures relating to the supply and distribution of water for irrigation; and damage to crops in the field. Assuming that the island falls some time in advance of the occupation of Japan, the market to which the bulk of Taiwan's agricultural exports formerly went will not be open, on the one hand; whereas, on the other hand, the fertilizers, wheat, and soybeans imported through Japan and Manchuria will not be available from that source.

If such is indeed the situation upon the liberation of Taiwan, several important problems will exist. First of all, there will be a problem of land adjustment. In the event that any considerable proportion of the sugar mills cannot continue to operate, sugarcane will have to be abandoned on large areas of land. This means that other crops will have to be found for such land. Substitute crops to replace a part of the sweetpotato acreage would also be called for in case an outlet is not found for dried sweetpotatoes.

There would also be problems of production. A loss of irrigation facilities might make it impossible, in certain areas, to produce a sizable first crop of rice, and yields of the second crop would probably be lowered. A lower yield would also result if fertilizers were not imported. The total drop, in any case, probably would not be sufficient to bring about a shortage of total foodstuffs. The surplus of former years was too great. It might, however, cause serious economic distress among farmers, who, because of the smallness of their holdings, were heavily dependent upon a large production per unit of land. A loss of cash income from the sale of surpluses, also, would leave a still larger number without the means to purchase clothing, fertilizers, and other needed articles not produced on the farm. Attention to the repair of irrigation facilities and to the provision of fertilizers, therefore, would seem of great importance.

Assuming that production can be restored to something like pre-war levels, one might also anticipate that new outlets for surplus products would have to be found. These include sugar, rice, dried sweetpotatoes, fruits, and tea (see tables 4, 5, 6, and 9 for the quantities formerly exported). Until indications of the conditions to be expected upon liberation are clearer, there is little value in speculating upon the amounts that might subsequently be available for export. The surplus available of such products as sugar and rice, under the assumed conditions, will most likely be greatly below the amounts formerly exported. The pineapple industry will probably have been nearly eliminated, owing to the difficulty in getting tin plate for canning. Lesser quantities may be expected of most of the remaining agricultural commodities. Nevertheless, if damage is quickly repaired, the surplus of some of these items may shortly become considerable.

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Wartime Changes in World Food Production

by C. M. PURVES*

After the outbreak of the war the world food situation changed quickly. Market surpluses in many important farm products dwindled to relative scarcity. Acute food problems arose in war-torn areas. In some quarters there was apprehension of inadequate food production and of a widespread food shortage throughout the world. This apprehension together with a growing realization that a large part of the world's population is chronically underfed, even in normal times, focused public attention on the case of the food supply of war years and after.

The threat of food scarcity in the face of increasing demand and the disruption of world trade has caused many countries to attempt to expand their food production and to become more nearly self-sufficing in food supplies. In many of the countries with adequate resources, there has actually been a marked expansion in food production. On the other hand, in some of the countries most vitally affected by the war, there has been a material reduction. There also has been a marked shift in the types of food products produced; for example, from livestock to crop production. These shifts have greatly increased the need for a measure of the changes in the world supply of food as well as changes in production by major geographic regions and by type of product.

The world's total food production, measured in caloric value of farm output, has increased since the outbreak of the war, but the relative gain has not exceeded the estimated increase in the world's population. Significant variations in production have also taken place among the several regions and countries.

In North America, farm production of food increased 30 percent from the pre-war period to 1942–43[1] and in South America 17 percent. In southern and eastern Asia, Oceania, and South Africa the increase was slight, and an average over-all decline of about 5 percent occurred in western Europe, North Africa, and the Middle East. In some other areas, not covered by this study, including the war-torn parts of the Soviet Union, Occupied China, and the Dutch East Indies, the decline was probably greater, but available data are too incomplete to measure it. These regional variations are due to many causes, which include differences in agricultural resources, the direct impact of war upon production and transportation, and governmental programs for meeting wartime food requirements.

The findings are based on a study of total food production in 30 countries, having about 60 percent of the world's population, and of the production in all countries of five leading food crops, which provide about 50 percent of the world's food supply in calories. These countries and crops together are believed to present a reasonably accurate picture of the over-all food output of the farms of the world since the war began.

This study was made for the purpose of measuring the changes in total production of food crops and livestock products "at the farm," not at the consumer level. Hence no effort was made to estimate the effect on total food available for consumption resulting from such changes in processing as, for example, increased extraction rates in the milling of bread grains.

The level of food production in the 30 countries was summarized by major geographic regions and by types of commodities. (See table 1.) The most outstanding regional increase occurred in North America, with sharp advances in edible oils, meat and poultry products, and significant increases in all other types of products. The greatest proportionate increase occurred in the edible-oil crops of the Americas, where an acute shortage developed after the Pacific war shut off supplies from eastern Asia and the East Indies. Among individual countries, the highest proportional increase in production, measured in calories, occurred in Norway and the United Kingdom.

The changes in total production by type of products (table 1) show a marked shift in the general pattern of agricultural output in the different parts of the world. In countries and regions that normally produce less food than they consume, western Europe for example, food crops have been emphasized more than fodder crops and livestock. This followed because of the cessation of feed imports and because, by the shift from animal products to food crops, these countries could more nearly meet the calorie requirements of their people from their available agricultural resources. On the other hand, the surplus producing regions, especially North America, strongly emphasized livestock products, but food crops increased almost as much as did the output of livestock products. This made it possible to supply the overseas forces, the United Kingdom, and the Soviet Union with large quantities of animal products in processed and concentrated form and to do so with economy of shipping.

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*Principal Agricultural Economic Statistician. This article is the summary of a detailed study published in December 1944 by the Office of Foreign Agricultural Relations.

[1] When used in this way, "1942–43" refers to an average of the 2 calendar years 1942 and 1943 in comparing wartime production with production in pre-war years, made to avoid a possible abnormal annual fluctuation.

TABLE 1.—*World food production by major geographic regions and by type of product*

[Average of production in 1942 and 1943 as a percentage of pre-war period [1]]

Type of product	North America	South America	Western Europe and North Africa	Middle East	Oceania and South Africa	Southern and eastern Asia	All Countries [2]
Crops:	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Cereals	130	104	98	99	94	102	106
Fruits and vegetables	118	130	105	87	124	104	109
Edible oils	162	297	109	66	(3)	109	123
Sugar	108	120	98	140	96	104	105
Total	129	118	100	96	96	103	107
Livestock products:							
Meat, poultry and eggs	143	116	66	91	124	75	108
Dairy products	119	120	83	77	101	100	101
Total	132	117	75	86	113	94	105
Grand total	130	117	94	95	101	103	107

[1] Production measured in calories for 30 countries. The average of 1942 and 1943 is expressed as a percentage of a pre-war base. The pre-war average differs slightly by countries because of lack of comparable data or in order to obtain a normal period of pre-war production. For most countries the pre-war average was 1933–37, 1934–38 or 1935–39.

[2] The countries included in the various regions are as follows:

North America—Canada, United States, and Mexico.
South America—Brazil, Uruguay, Argentina, and Chile.
Western Europe and North Africa—United Kingdom, Eire, Norway, Sweden, Denmark, Germany, France, Italy, Spain, Tunisia, Algeria, and French Morocco.
Middle East—Egypt, Palestine, Turkey, Greece, and Bulgaria.
Oceania and South Africa—Australia, New Zealand, and Union of South Africa.
Southern and eastern Asia—India, Unoccupied China, and Japan.

[3] Production insignificant.

In those countries for which available data were has actually declined during the war, partly because tion, at the farm level, estimates were made individually for a few of the more important food products, including the principal cereals, sugar, and potatoes. These are summarized (table 2), and their total caloric value is expressed as a percentage of the 1933–37 average production. The percentages reflect the changes in production in all countries that produce significant amounts of these food products, including the Soviet Union, Occupied China, and the Dutch East Indies, where production has been reduced during the war.

These products, as already noted, represent about one-half the world's food calories. They are particularly important sources of food in the areas where the devastation of war has curtailed production. The figures do not reflect, however, the marked increase which has occurred in the production of fats and oils, mandioca, pulse crops, and many minor food crops that have become important locally, nor do they reflect the increase in the proportion of the cereal crops that has been used as food during the war. The percentages in table 2 therefore, probably, reflect less, whereas those in table 1 reflect somewhat more than the total increase in food production since the pre-war period.

A comparison of the changes in production, as shown by regions (table 1) and by commodities (table 2), reveals certain variations in the changes in production from the pre-war period to 1943. For example, in table 1 cereal production in 1942–43 appears to be 6 percent above that of pre-war, whereas the world production of wheat and rye, as shown in table 2, was slightly below and rice production about 4 percent above the pre-war level. This difference occurs partly because table 1 does not reflect the upward trend in the production of coarse cereals in India, Unoccupied China, and Latin America or the drop in the production of wheat and rye in the Soviet Union, one of the world's largest producers of these grains.

TABLE 2.—*Index numbers of world population and of world production of selected food crops, 1933-43*

[Base period 1933–37=100]

Year	World population [1]	Food Crops				
		Wheat and rye	Rice	Sugar	Potatoes (2)	Total (3)
1933	98	103	102	91	91	100
1934	99	96	90	92	96	94
1935	100	98	97	100	85	97
1936	101	94	103	109	108	100
1937	102	109	107	108	120	109
Average: 1933–37	100	100	100	100	100	100
1938	103	116	106	103	101	110
1939	103	109	103	111	102	107
1940	104	103	95	111	106	102
1941	104	100	101	100	104	101
1942	105	99	100	98	114	101
1943	105	96	108	102	86	100

[1] Estimates from 1933 to 1939 based upon trend of increase in world population from 1925 to 1936 as estimated by International Institute of Agriculture. Estimates of rate of increase in population during war years assumed to be half as much as in pre-war years.

[2] Includes all important producing countries except the Soviet Union.

[3] Combined production of crops listed, in terms of calories, after adjustment for the average proportion of each product used for food. During the base period the quantity of these crops used for food was equal to slightly more than 50 percent of the total calorie requirement of the world population.

The increase in fruits and vegetables indicated in table 1 results largely from the expansion in the production of potatoes, sweetpotatoes, mandioca, and pulse crops and is probably indicative of the wartime changes in world output of these products. The total production of potatoes in 1943, as shown in

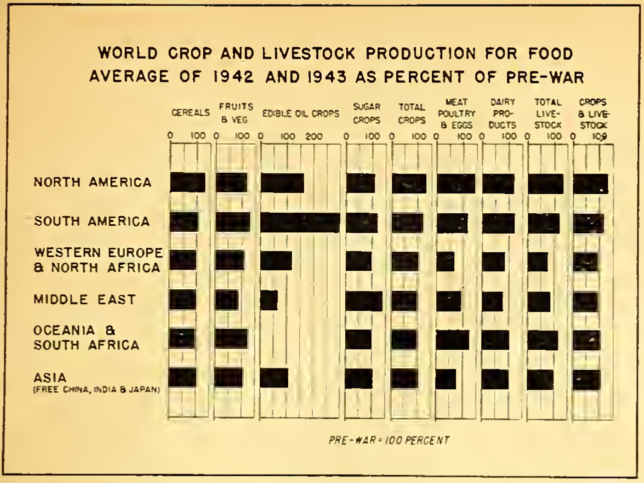

FIGURE 1.—In wartime nearly all areas of the world are more dependent on locally produced supplies of foods and feedstuffs than in peacetime. There is also a marked increase in the demand for foods. In the present world war, these factors have caused material changes in the level of food production in many areas of the world, as well as sharp changes in the type of products produced. Marked increases in some areas have been offset by decreases in others, resulting in only a small net gain in the total food output during the war years.

table 2, was down sharply because of the short crop in Europe; but this did not result in a corresponding reduction in food supply, because a much larger proportion of the reduced crop was used for food.

If the figures in table 1 included all the countries of the world, the increase in the edible-oil crops probably would be much less than indicated. Many of the 30 countries covered are normally large importers and were obliged to expand their domestic output when the war cut them off from the supplies of southeastern Asia. Furthermore, production of edible oils in the countries not included probably has actually declined during the war, partly because the war excluded these products from their normal markets.

The total production of sugar in 1942–43 was estimated at the pre-war average, whereas table 1 indicates a 5-percent increase. The exclusion of Java, the Philippine Islands, and the Soviet Union largely explains this discrepancy, because they are important sugar producers and their production is believed to have declined considerably since 1939. The estimates of production of meats and dairy products (table 1) also may be slightly higher than the true average, since they include the increases that have occurred in the larger producing areas of North and South America and do not include the sharp declines in such devastated areas as European Russia, where livestock numbers have been materially reduced.

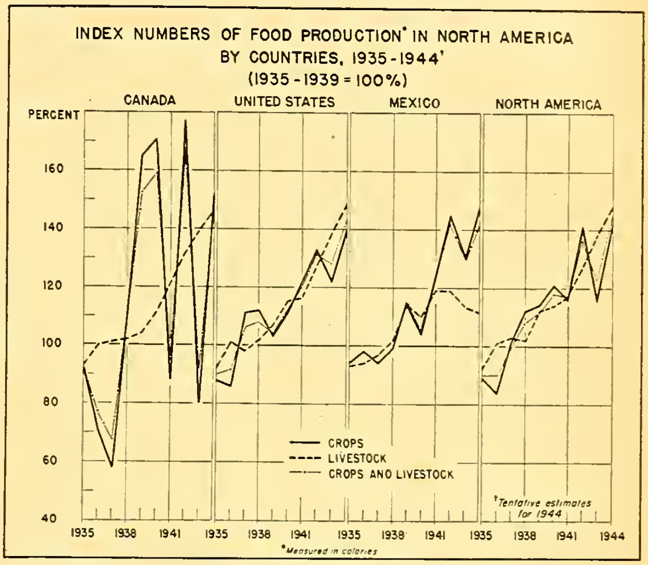

FIGURE 2.—The sharp increase in food production in North America since 1938 has been an important factor in providing the Allied Nations with adequate food supplies to meet increased wartime requirements. All countries have shared about equally in the increase, and expansion has been general for nearly all types of foods. The marked upward trend in production has resulted in part from favorable weather conditions in most of the war years, but the concerted effort of farmers to meet the increased war needs was a major factor in the increased output.

If allowance is made for the limitations of the statistics (tables 1 and 2), they clearly show that the marked increase of food production in some areas during the war years has been offset in part by decreases in other areas. The net result is an increase in the world's farm production of food, but this

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increase is probably no more than sufficient to keep pace with the estimated increase in population (first column, table 2).

A significant point is, however, that a marked increase has occurred in food production in several important countries and regions. Moreover, in those areas where production has been interrupted by the war, an increase above present reduced levels appears likely when farmers can again get fertilizer, equipment, labor, etc., in a gradual return to normal food production. Then the total world production of food may be significantly larger than in pre-war years, unless production in other areas is readjusted to a more nearly normal pattern. It is doubtful, however, whether production in all areas where expansion has occurred will be reduced to pre-war levels, at any rate, for some time. Possibly the distribution of production among the several major products and producing areas may be materially different from the pre-war pattern of production, which may create many problems of readjustment of production and trade during the post-war period.

Food in Continental Europe*

The 1944 harvest in continental Europe (excluding Soviet Russia) has apparently been poorer than the subnormal harvest of 1943. Weather conditions during the fifth wartime growing and harvesting period were not sufficiently favorable to compensate for the increased strain on agriculture's productive capacity caused by continued and, in some cases, severe shortages of labor, fertilizer, draft power, and machinery. Preliminary estimates indicate a decline in grain output. A decline in sugar-beet output is also probable. Potato production may be little, if any, larger than in 1943, when central and parts of western Europe had a very short crop. Efforts were made to achieve a further expansion in the oilseed acreage, but yields over large areas were disappointing. Moreover, the output of olive oil will be considerably below the large production of last year.

Milk production in 1944–45 may not be greatly different from the previous year when it was from 15 to 20 percent below pre-war. Egg production is not likely to exceed the very low level reached in 1943–44. Meat production may be slightly above 1943–44, but still about one-fourth below pre-war.

Any decline in total farm production of food and feed in Europe in 1944–45 is almost certain to result in a decline in food available for direct human consumption. This follows from the fact that the shift in crop production and utilization from feed to food virtually reached its practicable limit in earlier war years. Total production of food, in terms of calories, should, however, still amount to between 95 and 100 percent of production in the pre-war years, when an additional food supply was imported, amounting to about 10 percent of total consumption. With allowance made for a probable reduction in imports other than relief shipments, following Germany's loss of Russian territory, and for the increase in population, the caloric value per capita of food supplies available on the average for the Continent as a whole may be estimated at a little more than 85 percent of the pre-war level, with a marked deterioration in the composition of the food supply.

Since producers will no doubt continue to eat at or near pre-war levels, the burden of any decline in food supplies will be borne, as in past years, by the nonfarm population, millions of whom have been subsisting during much of the war period on less than 2,000 calories per person per day. The disruption of intra-European trade will result in a reduction of available food supplies in a number of countries. Even in those countries where the cessation of German requisitions will mean an increase in domestically available supplies, there is not likely to be a corresponding improvement in the food situation of those population groups who have suffered most, unless internal transportation facilities are reasonably well maintained and control over farm deliveries and distribution is at least as effective as it was in the earlier war years.

The food situation in the Soviet Union has continued to be tight during recent months. Though perhaps reduced by considerable harvesting losses, the otherwise good 1944 harvest from an increased acreage has probably resulted in a considerably larger grain crop compared to 1943. Supplies available to the Soviet Union should be further improved over those of 1943–44 by the elimination of German requisitions and the acquisition of some surpluses from the Danubian countries. The severe shortage of fats and meats, however, is expected to continue during 1944–45.

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